IFAC TECHNICAL COMMITTEE (TC 5.2)
triennial REPORT 2014 - 2017

Report covering period
(This report is provided in addition to the event list and statistics derived from the IFAC event data base, it addresses the workings of the TC, as provided by the TC Chair on recommendation of the TC)

TC Name Manufacturing Modelling for Management and Control
TC Number 5.2
TC Chair Alexandre Dolgui
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TC Report (in 1st year of triennium)	**yes**	**no**
Have you nominated your TC vice-chair(s)?	☒	☐

(*list all*)
- Name Natalia Bakhtadze (Russia), Oleg Gusikhin (USA), Dmitry Ivanov (Germany), Farouk Yalaoui (France)
- E-mail Sung7@yandex.ru, ogusikhi@ford.com, Dmitry.Ivanov@hwr-berlin.de, Farouk.Yalaoui@utt.fr

Have you updated your membership roster?	☒	☐

- Number of TC members 86

Have you sent your membership roster to the Secretariat?	☒	☐
Have you updated your TC scope?	☒	☐

TC Scope: The activities of the Committee are devoted to promote the development of formal descriptive or prescriptive models and optimization techniques for design, control and management of manufacturing and logistics systems

Have you created/amended your TC website?	☒	☐

- Web page address http://tc.ifac-control.org/5/2

List of Working Groups (5 working groups)

- Name: WG 1 "Supply Network Engineering"
- Chairs: Prof. Dr. Alexandre Dolgui (France), Prof. Dr. Dmitry Ivanov (Germany)

- Focus: The working group explores and generates novel solutions to supply chain design and management on the cut edge of advanced industrial engineering, operations research, supply chain management and information technology. This scientific domain concerns the methodical evaluation and optimization of production systems, logistics networks, and their management policies to increase the effectiveness of multifaceted demand and supply chains. The major industrial problems and various approaches to supply chain design, supply chain planning, inventory control in supply chains, use of intelligent information technology and process automation methods are in the scope of the research. The special focus is directed to supply chain risk management and resilience. We consider supply chains as dynamic systems and develop integrated planning and control models and algorithms to increase supply chain resilience and efficiency.

- Timeline: WG was created in 2009

- Deliverables:
- 2014/15: 2 chapters of book, 1 special issue of an international journal, 6 invited sessions
- 2015/16: 2 chapters of book, 1 special issue of Int J Prod Res, 14 invited sessions at conferences, including 5 invited sessions at IFAC symposium INCOM 2015 in Ottawa, Canada, as well as 1 Track at OR 2015
- 2016/17: 1 special issue of Int J Prod Res, 5 invited sessions at IFAC conference MIM 2016 in Troyes, France, 2 Open Invited Tracks at IFAC WC in Toulouse (32 accepted papers), 3 Technical Associate Editors for WC IFAC 2017, as well as 1 Track at OR 2016

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- Name: WG 2 "Advanced multi-criteria applications in manufacturing and logistics"
- Chairs : Prof. Dr. Lyes Benyoucef (France), Dr. Aguirre Hernan (Japan) and Prof. Dr. Farouk Yalaoui (France)
- Focus: Multi-criteria approaches have been put to use in multiple segments of manufacturing and logistics. They have taken a prominent role to integrate people, information and products across integrated supply chain boundaries including management of various manufacturing, logistics and retailing operations such as in manufacturing, warehousing and distribution of goods and services. Decisions involving customer profiling, new product development, retail marketing, and sales patterns are immensely refined using innovative multi-criteria approaches. Also, as such decisions have an impact on the overall integrated logistic network processes, it is important that innovative multi-criteria-based tools also be linked to integrated supply chain management applications. The working group aims to align latest practice, innovation and case studies with academic frameworks and theories. It will cover the latest research results and efforts at different levels including quick-response system, theoretical performance analysis, performance and capability demonstration, hoping to cover the role of multi-criteria approaches in optimizing manufacturing and logistics.

- Timeline: WG was created in 2011

- Deliverables:
2014/15: 4 chapters of books, 8 invited sessions at different conferences
2015/16: 1 edited book, 3 chapters of books, 9 invited sessions at different conferences including IFAC INCOM 2015
2016/17: 1 special issue of IJPR (jointly with WG Supply chain Engineering", 4 invited sessions at IFAC MIM 2016, 2 Technical Associate Editors for WC IFAC 2017, 1 Open Invited Track

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- Name: WG 3 "Design and Control of Reconfigurable Manufacturing Systems"
- Chairs : Dr. Olga Battaïa, Dr. Xavier Delorme (France), Dr. Rita Gamberini (Italy) and Prof. Manoj Kumar Tiwari (India)

- Focus: The working group investigates and develops novel modelling approaches for designing and management of reconfigurable machining, assembly and disassembly systems. One of the main characteristics of these automated systems is that they use reconfigurable

manufacturing technologies for fast adaptation to changes in the quantity and mix of products. Indeed, the industry's new requirements for manufacturing systems given the shorter and shorter product runs and the need for more customization. The production systems should be designed to be able to make changes in its physical configuration to answer market fluctuations in both volume and type of product. One of the principal characteristics of reconfigurable manufacturing systems (RMS) is modularity: in a reconfigurable manufacturing system, all the major components are modular (system, software, control, machines and process). Selection of basic modules and the way they can be connected provide systems that can be easily integrated, diagnosed, customized, and converted. An RMS is also supposed to quickly integrate new technologies to improve its efficiency. RMS is assumed to be the perfect tool for the new era of mass customization that requires simultaneously the productivity of dedicated system and the flexibility of agile manufacturing system. The aim of this working group is a review on this topic, more particularly on the challenges of flexibility and reconfigurability for assembly, disassembly and machining systems.

- Timeline: WG was created in 2009 by Alexandre Dolgui, managed by new team of co-chairs since May 2015

- Deliverables:
- 2014/15: 1 chapter of book, 6 invited sessions including a session at WC in cap Town
- 2015/16: 3 invited sessions for IFAC MIM 2016
- 2016/17: 2 special issues in preparation (Omega and IJPR), 1 Open invited Track at IFAC WC in Toulouse

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- Name: WG 4 "Advances in Integrated Maintenance Management"
- Chairs : Prof. Dr. Anis Chelbi (Tunisia), Prof. Dr. Ali Gharbi (Canada) and Prof. Dr. Nidhal Rezg (France)

- Focus:
Ameliorating the situation of an industry requires certainly reducing costs and maximizing the customer satisfaction. These two aims cannot be achieved without good management and a good know how while making decisions. These decisions are generally associated, at least, with three levels of the hierarchical planning process: strategic, tactical and operational levels. Generally, manufacturing industries aims at determining the most adequate integrated maintenance production strategies which helps them to optimize the system exploitation and to reduce several costs. Releasing such an efficient planning urges firms to have a global vision on their production and maintenance process which may be looked upon as an inter-dependent set of sub systems performing various functions including ordering raw materials, assembling pieces, controlling quality, repairing machines, storage, etc. One of the key issues in up-to-date research in integrated maintenance production strategies is to develop a set of new intelligent integrated maintenance policies which integrate maintenance and production aspects with taking into account several environment constraints. The real goal is to face the various contemporary industrial constraints in order to optimize the system exploitation and to reduce several costs. The WG aims to present and analyze new methods and tools of new integrated maintenance strategies, in order to increase service level, system availability with reducing several costs. This objective can be realized by new organization of combined maintenance tasks, production planning, and resources of several activities.

- Timeline: WG was created in 2012

- Deliverables:
- 2014/15: 2 invited sessions for IFAC INCOM 2015
- 2015/16: 2 invited sessions for IFAC MIM 2016
- 2016/17: 2 invited sessions for IEOM 2016 and IEOM 2017, Organization of IESM Conference in October 2017 at HTW University of Saar in Saarbrücken City in Germany. Publication a New Book at WILEY 2016 "Production and Maintenance Optimization Problems - Logistic Constraints and Leasing Warranty Services". N. Rezg, Z. Hajej, V. Boschain-Campaner. ISBN 97861678630609569

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- Name: WG 5 "Risk, analytics and operations"
- Chairs : Prof. Dr. Desheng Dash Wu (Sweden) and Prof. Dr. Charles S. Tapiero (USA)

- Focus: Operations Risk Analytics will enable the growth and understanding of best practices in operations, e.g., pricing functions. Banks are processing millions of transactions everyday in order to protect against fraud and terrorist financing. Energy companies monitor operations process and customer activities to protect again abnormal and predict spikes in demand. Risk analytics in business intelligence represents data-oriented techniques to supplement business systems for better risk-based decision making. Risk performance analysis in manufacturing intelligence uses advanced data analytics, modeling and simulation to produce a fundamental transformation to new product-based economics through internet--based service enterprises and demand--driven supply chains. Risk evaluation plays key roles in emerging areas such as bio--manufacturing, nanotechnology, and energy. We see a dramatic increase in the use of predictive analytics in these and many other areas. This working group will bring together scientists who have different backgrounds and disciplines, and provide a set of opportunities to discuss these open issues.

- Timeline: WG was created in June 2015

- Deliverables:
- 2014/15: groupe was created in 2015
- 2015/16: 1 authored book (by two co-chairs of the WG), 2 special issues of international journals (Omega and IFAC EAAI), 1 workshop in China(with IEEE), 1 invited sessions for IFAC MIM.
- 2016/17: 1 authored book (by co-chairs of the WG Dash Wu and David Olson), 2 special issues of international journals (Risk Analysis and International Journal of Production Economics), 1 symposium in Beijing in August 2016 (with IEEE).

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At the TC level, the major results of the TC 5.2 from 2014 to 2017 deal with the organization of 3 major events:

- IFAC WC 2017, Toulouse, France (about 100 submitted papers, 67 accepted; 4 Open Invited Tracks)

- Triennial conference IFAC MIM 2016, Troyes, France (540 participants from 51 countries)

- Triennial symposium IFAC INCOM 2015, Ottawa, Canada (477 attendees from 47 countries)

For the IFAC WC in Toulouse, we have organized 4 open Tracks:

Industrial Engineering for Hospital and Home Healthcare, by Maria Di Mascolo and Thibaud Monteiro

"Assembly System 4.0": From workstation to assembly line design, from part logistics to information flow management for smart assembly systems in the Industry 4.0 era, by Yuval Cohen, Maurizio Faccio and Francesco Pilati

Intelligent Systems supporting Supply Chains Decision Making, by Enzo Morosini Frazzon, Michael Freitag, Carlos Eduardo Pereira, Bernd Hellingrath and Shimon Y. Nof.

Supply Network Engineering, Dynamics, and Control, by Alexandre Dolgui, Dmitry Ivanov and Boris Sokolov

IFAC conference MIM 2016 in Troyes, France, 28-30 June 2016.
http://mim2016.utt.fr/
(609 papers received from 51 countries)

At IFAC MIM 2016, our TC 5.2 has organized 26 invited sessions and 4 Tracks, the invited sessions are as follows:
Integration of Supply Chain Planning and Intelligent Systems (p25g3): Enzo Morosini Frazzon, Carlos Eduardo Pereira, Bernd Hellingrath, Shimon Y. Nof
Supply Chain Management and Scheduling of Distributed Systems (nvuxf): Achraf Jabeur Telmoudi, Malek Masmoudi, Lyes Benyoucef
Integrated production and delivery problems (v24t8): Alessandro Agnetis, Christian Artigues, Jean-Charles Billaut
Complex systems scheduling: modeling and optimization (vk372):Yassine Ouazene, Farouk Yalaoui, Martin G. Ravetti, Mauricio C. de Souza
Metaheuristic Approaches for Real-Time Scheduling and Low Power Consumption Optimization in Embedded Systems (2ww2n): Hamza Gharsellaoui, Samir Ben Ahmed, Ammar Hamad, Farouk Yalaoui
Metaheuristics for Operations Management in Intelligent Manufacturing Systems and Logistics (73a27): Fayçal Belkaid, Zaki Sari, Farouk Yalaoui
Control approaches to supply chain analytics, scheduling, and discrete systems (115q1): Dmitry Ivanov, Alexandre Dolgui, Suresh P. Sethi, Richard F. Hartl
Supply Network Resilience and Dynamics (3quav): Dmitry Ivanov, Alexandre Dolgui, Tadeusz Sawik, Wenjun Zhang
Supply Chain Scheduling (ragw8): Nicholas G. Hall, Dmitry Ivanov, Mikhail Y. Kovalyov
Recent trends in optimization methods for the design of manufacturing systems (akfs7): Hicham Chehade, Farouk Yalaoui, Mustapha Nourelfath, Nazir Chebbo
Balancing and Sequencing of Flexible and Reconfigurable Production Lines (33eip): Olga Battaïa, Xavier Delorme, Rita Gamberini

Modeling and optimization in design of assembly/disassembly lines under uncertainty (fsb4m): Mohand Lounes Bentaha, Olga Battaïa, Alexandre Dolgui, Pascale Marange, Alexandre Voisin
Design Problem Solving with Systematic Innovation (yf564): Helena V. G. Navas, Virgílio Cruz Machado
Integration of Human Factors Principles in Systematic Innovation and Lean Environments (8bsp7):Isabel L. Nunes, Helena V. G. Navas,Virgílio A. Cruz
Optimization in Wireless Sensor networks (3tk1f): Faicel Hnaien, Hichem Snoussi, André Rossi
System Identification for Manufacturing Control Application (696yp): Vladimir Lototsky, Natalia Bakhtadze, Kirill Chernyshov, Elena Jharko
Recent fuzzy logic applications in manufacturing and logistics (x68u9): Lyes Benyoucef, Manoj K Tiwari
Advanced multi-criteria applications in manufacturing and logistics (xp8am): Lyes Benyoucef, Hernan Aguirre, Farouk Yalaoui
Multi-level, Collaborative and Robust Production Networks (d2896): Laszlo Monostori, Botond Kadar, Marcello Colledani, Gisela Lanza, Juan Manuel Jauregui Becker
Advanced evolutionary algorithms for effective supply chain management (6axm6): Lyes Benyoucef, Manoj K Tiwari
Replenishement planning with price and lead time quotations under uncertainties (wa929): Faicel Hnaien, Alexandre Dolgui
Operations risk analytics and pricing (75k19): Alexandre Dolgui, Liang Liang, David L. Olson, Charles S. Tapiero, Desheng Dash Wu
Maintenance and Production Control under Ecological, Warranty, and Subcontracting Constraints (ahbrt): Nidhal Rezg, Zied Hajej
Reliability and Maintenance for Industrial Systems and Networks (3f1r5): Mohamed-Larbi Rebaiaia, Daoud Ait-Kadi, Hayet Mouss, Zineb Simeu-Abazi.
Optimization of the hospital department: surgical block and emergency (9fmfs): Yasmina Kerboua Ziari, Hania Kherchi, David LAPLANCHE, Farouk Yalaoui

TC5.2 co-organized the IFAC symposium INCOM 2015 in Ottawa in 2015
http://incom2015.org/

The TC chair (Prof. Alexandre Dolgui) was the IPC chair of INCOM 2015. The TC5.2 has organised at INCOM 2015 15 invited sessions:

- Supply Network Dynamics, Disruption Management, and Control - 2 sessions by Alexandre Dolgui, Jean-Claude Hennet, Dmitry Ivanov, Boris Sokolov

- Information Sharing and its Impact on Inventory Management in Production & Logistics Systems by Bahman Rostami-Tabar, Evren Sahin, Lyes Benyoucef

- Inventory control, Replenishment and Lot-sizing under Demand, Yield or Lead Time Uncertainties by Alexandre Dolgui, Frédéric Grimaud, Faicel Hnaien, Aly Mohamed Ould Louly

- Supply Chain Scheduling by Nicholas G. Hall, Dmitry Ivanov, Mikhail Y. Kovalyov

- Advanced Evolutionary Algorithms for Effective Supply Chain Management by Lyes Benyoucef, Manoj K Tiwari, Evren Sahin

- Performance Evaluation and Optimization of Manufacturing Systems by Yassine Ouazene, Alice Yalaoui, Mustapha Nourelfath

- Assembly Line Balancing and Scheduling Problems - 2 sessions, by Xavier Delorme, Alexandre Dolgui, Oleg Gusikhin, Evgeny R. Gafarov, Oncu Hazir

- Design, Balancing and Optimization of Assembly and Disassembly Lines by Olga Battaïa, Mohand Lounes Bentaha, Alexandre Dolgui, Manoj K Tiwari

- Human Factors in Industrial and Logistic System Design - 2 sessions, by Fabio Sgarbossa, Daria Battini, Christoph Glock, Eric Grosse

- Models and Methods to Support the Re-design of Flexible Production Systems by Alexander Fay, Birgit Vogel-Heuser, Christian Diedrich

- Maintenance and Production Control under Leasing, Warranty, and Subcontracting Constraints by Nidhal Rezg, Zied Hajej, Ali Gharbi

- Operations Risk Analytics and Pricing by Liang Liang, Alexandre Dolgui, Desheng Dash Wu

Date and Place of Last TC Meeting in Ottawa at the IFAC INCOM 2015 symposium on May 11, 2015, then at IFAC MIM 2016 conference in Troyes, France on June 29, 2016, the next one will be at the IFAC WC in Toulouse

Is your TC contributing to a Milestone Report ? ☒ ☐

Congress Year Report only

- Number of Congress Papers Reviewed by TC about 100, the exact number was not provided by the organizing committee

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Events sponsored or co-sponsored by your TC:

From April 2015 to March 2016:

INCOM 2015, Ottawa, Canada, Mai 2015, trinnenial symposium of CC, the chair of IPC for INCOM 2015 was prof. Alexandre Dolgui, chair of TC 5.2, 477 participants from 47 countries

8th IFAC conference MIM 2016, the triennial conference of TC 5. 2 in Troyes, France 27 - 30 June, 2016, 609 papers submitted, 540 participants from 51 countries

Also, the TC 5.2 has co-sponsored the conference and workshops:

12th IFAC Workshop on Intelligent Manufacturing Systems, December 5-6, 2016, Austin, TX USA, 100 participants

IFAC conference 7th IFAC Conference on Management and Control of Production and Logistics MCPL 2016, Bremen, Germany, February 22- 24, 2016, 130 participants

14th IFAC Symposium on Large Scale Complex Systems: Theory and Applications (LSS 2016), in Riverside, USA, from May 31 - June 3, 2016.

3rd IFAC Workshop on "Advanced Maintenance Engineering, Service and Technology" - AMEST 2016 in Biarritz, France; from October 19-21, 2016

The workshop "Enterprise Integration, Interoperability and Networking - EI2N 2015", in Rhodes, Greece, from October 28-29, 2015

Plans for TC?

To prepare a special issue of an IFAC journal on the topics of IFAC TC 5.2 and by the members of IFAC TC 5.2

To edit a new book with a large participation of the members of IFAC TC 5.2

Problems - especially any that require TB attention?
No problem

What is the long-term outlook for the scientific topics of your TC?
Please describe likely future major developments within the scope of this TC
Industry 4.0 technology enables new production strategies that require highly customized supply network control; creation of resilient supply chains; facilitate developments in design and control of resilient and digital manufacturing networks.

Recommendation
Please provide recommendations relevant to TC operation such as potential new Working Groups, recommendations to merge this TC with another TC, new trends within the technical field covered by the TC that suggest future changes in IFAC scope or activities, etc.)

The TC chair will be changed after the IFAC WC in Toulouse; our next conference MIM 2019 was launched and will held in Berlin, Germany, it will be organised by the new TC chair prof. D. Ivanov